

REMARKS

Summary of Changes Made

Claim 23 has been amended to recite a temperature range of about 90°F to about 140°F. The application was originally filed with claims 1-22. In a previous amendment, claims 2, 4, 6, 15, and 21 were canceled, and claim 23 was added. Accordingly, claims 1, 3, 5, 7-14, 16-20, 22, and 23 (18 claims) remain pending in the application. No new matter is added by this amendment.

Claim Rejections - 35 U.S.C. §103(a) (Schofalvi/Dönch)

The Examiner has rejected all pending claims (1, 3, 5, 7-14, 16-20, 22, and 23) under 35 U.S.C. § 103 over Schofalvi et al., U.S. 2003/0220424, now U.S. 6,846,862 (“Schofalvi I”) or Schofalvi et al., U.S. 6,376,585 (“Schofalvi II”) (collectively “Schofalvi”) in view of Dönch, et al., U.S. 4,851,189, (“Dönch”). The Examiner contends that Schofalvi I discloses a powder metallurgy composition comprising metal powder, a binder composition comprising an aliphatic polyester polymer, an ethylenebisamide wax, a guanidine wetting agent, and a debinding accelerator. The Examiner further contends that Schofalvi discloses a method of forming a green composition by injection molding or compacting and sintering.

The Examiner admits that Schofalvi fails to disclose graphite powder. However, Dönch is cited as disclosing the use of graphite powder as an alloying agent in a metal powder to provide strength in a sintered product of such powders, with regard to claims 14 and 16.

With respect to claims 1, 3, and 13, the Examiner believes that the formation of a liquid phase and the amounts of binder in the composition are inherently disclosed by Schofalvi. The examiner further contends that Schofalvi explicitly discloses the limitations of claims 5-12.

Applicants traverse the rejections. Because the Examiner treats Schofalvi I and Schofalvi II to be interchangeable, Applicants herein consider that the rejections are based on either the combination of Schofalvi I with Dönch, or the combination of Schofalvi II with Dönch. References to Schofalvi I will be by paragraph number, and references to Schofalvi II will be to

column and line number. The Examiner failed to note an important aspect of the Schofalvi reference. Each and every embodiment therein includes a binder, which is an aliphatic polyester polymer. No embodiment of the Schofalvi compositions lacks such a binder. Applicants admit that Schofalvi contemplates the use of a lubricant, as generally noted in a single instance, paragraph [0147]. The combination of Dönch, which discloses the use of graphite powder to desirably form a carbide in a sintered metal operation, together with Schofalvi, fails to disclose or suggest all elements of the instant claims.

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). Further, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). The two principles are intimately related inasmuch as failure to consider a reference in its entirety leads naturally to modifying or combining a reference in a way that violates its express teachings. The Examiner has apparently ignored both of these bedrocks of obviousness jurisprudence.

The Examiner fails to appreciate that Schofalvi discloses compositional elements not instantly disclosed or claimed, namely, an aliphatic polyester polymer. This element is critical to the teachings of Schofalvi. Further, this disclosure of Schofalvi is precisely the element that makes the combination of Schofalvi and Dönch improper.

The presently claimed invention does not disclose or claim a polymer, a polyester, or thermoplastic of any kind. Because the Examiner must consider the prior art references as a whole, including those portions that teach away from the combination supporting the rejection, the Examiner must note that the broadest teachings of Schofalvi involve a binder system. Further, the polyester polymer of Schofalvi is precisely the element that is critical to the intended operation of the Schofalvi invention. The Schofalvi reference is directed to a binder composition, not a lubricant, and hence differs fundamentally from the presently claimed

invention. The function and purpose of a binder is very different from that of a lubricant. The purpose of Schofalvi's invention is the creation of a binder system, which is easily removed from the powdered metal (or inorganic composition), which does not leave traces (ash, gas), paragraphs [0007]-[0008], and is easy to remove, paragraph [0009] by virtue of its low melting temperature, which provides a high green strength, and is thermally decomposable to simple waste products creating no ash or other undesirable constituents in a green part prior to sintering. Further, the binder should have an adjustable binding profile. The binder should be such that debinding and sintering can be carried out using the same equipment, on a continuous basis, paragraph [0011].

A primary mechanism of the Schofalvi invention is reverse debinding, paragraph [0002]. In conventional debinding, the surface agent releases first, the wax component releases next, and the major binder component releases last. Hence, reverse debinding occurs in the opposite order. The binder of Schofalvi comprises an aliphatic polyester polymer ("major component"); an ethylenebisamide wax; a guanidine wetting agent ("surface agent"). The reverse debinding of Schofalvi involves decomposing the polymeric polyester first. The polyester decomposes at 50-250°C, the guanidine wetting agent decomposes at 270-320°C, and the EBS wax decomposes at 300-320°C, paragraph [0026].

As a result of the reverse debinding profile of the binder composition according to Schofalvi, the aliphatic polyester is the first of the three primary binder ingredients (aliphatic polyester, ethylenebisamide wax and surface agent) to decompose in the debinding step. When the additive is a debinding extender, the debinding extender debinds after the surface agent and the bisamide wax, extending the time and/or increasing the final temperature of debinding. The debinding extender retains the inorganic powder in position for a longer time in the pre-sintering portion of the process. Retaining the inorganic powder particles in position for a longer time facilitates the transition from debinding to sintering, while reducing the chances that the inorganic powder particles will move or be distorted from their original position in the mold, and, in the case of certain high-temperature-sintering ceramics and high-temperature-melting metals, provides an extended time and/or temperature of binding, so that the particles are held in place by the binder for a longer time and to a higher temperature, allowing them to begin to

sinter in their intended position. As a result, superior sintered parts are obtained using the Schofalvi binder composition, paragraph [0029].

The importance of Schofalvi's aliphatic polyester polymer cannot be overstated; over five columns (paragraphs [0046]-[0076]) of the published patent application are devoted to it. Neither the present invention nor Dönch discloses nor claims a binder composition, nor a polymer, nor a polyester, nor a thermoplastic of any kind. The Examiner's modification to Schofalvi by Dönch requires Schofalvi to operate in a manner inconsistent with its teachings (i.e., Schofalvi cannot be practiced if it lacks an aliphatic polyester polymer). This rejection is hence improper.

Another important disclosure of Schofalvi is the undesirability of carbides, noted in Schofalvi II, at column 27, lines 42-62:

The debinding accelerator helps to avoid formation of carbides, which also may result from formation of carbonaceous impurities in the sintered part. When the part includes, e.g., tungsten in the inorganic powder, the presence of elemental carbon with the tungsten at sintering temperatures may give rise to rapid formation of tungsten carbide. Other carbide-forming metals may also form carbides if carbonaceous impurities are formed due to the decomposition of the polycarbonate polymer. Use of the debinding accelerator may help to avoid such possible problems.

Conversely, Dönch discloses the use of a graphite powder as an alloying agent to metal powder to provide strength from the product produced from the powders, col. 2, lines 23-34. The **formation** of a carbide is a key aspect of the Dönch disclosure, as most pointedly disclosed in claim 1:

1. Method of manufacturing cams for camshafts by powder metallurgy, wherein the formed cams have constant properties over the volume thereof and are well polishable, which comprises
 - (a) molding into a cam blank a powder mixture made up of iron powder alloyed with carbide-forming elements of the fifth and sixth secondary groups of the periodic table, and graphite powder in a quantity necessary for carbide formation;
 - (b) sintering the blank at a temperature of at most 50K above a solidus temperature of the blank;and

(c) compacting the blank by hot-isostatic compression at a temperature below the solidus temperature to at least 99% of a theoretical density.

Carbides are critical to Dönch because high hardness, modulus, etc., are critical to the cams and automotive parts formed by the processes of Dönch. The point of the Dönch invention is to prevent the formation of a **network** of carbides, column 3, lines 26-31, however the **formation** of carbides is necessary, column 4, lines 50-53.

Dönch also uses hot isostatic compression to at least 99% of theoretical density, column 3, lines 43-45. The compaction is preferably carried out at 900-1050°C, col. 3, lines 54-56. This is in direct contradiction to the far lower compaction temperatures instantly, which are below about 140°F (60°C), and also in contradiction to the the compaction (“pressing”) temperatures of Schofalvi, admitted by the Examiner to be “ambient.”

Applicants admit that Schofalvi discloses the use of a carbide powder as a possible inorganic powder ingredient, but emphasize that such carbide is not formed during the compaction or sintering processes disclosed therein. It is the formation of a carbide during sintering that Schofalvi strongly disparages.

Based on the undesirability of carbide formation in Schofalvi, and the requirement for carbide formation in Dönch, this incompatibility would lead one skilled in the art away from the combination as constructed by the Examiner. There is no claim, disclosure or suggestion of carbide formation in the instant application. Hence, the combination of either Schofalvi reference with Dönch as a basis for the instant rejections is unsustainable. Their combination fails to disclose or suggest all elements of the rejected claims, and fails to motivate their combination as required by the Examiner.

All of the foregoing should make evident that the Examiner has constructed a prior art rejection based on a combination of prior art which requires the main reference (Schofalvi) to operate in a manner inconsistent with its teachings. More importantly, the foregoing discussion

makes it clear that critical aspects of both the Schofalvi and Dönch disclosures would lead one skilled in the art away from the Examiner's combination in support of the instant rejections.

It is considered apparent that the foregoing makes eminently clear that all claims as they appeared in the previous amendment are patentable over the combination of Schofalvi and Dönch. The current amendment to claim 23 is intended to overcome the rejection with respect to Schofalvi alone.

Comments

Applicants expressly acknowledge that the rejections levied in the previous Office Action have been mooted in light of the new grounds of rejection. Applicants understand this to mean that the previous arguments were successful in overcoming said previous rejections, and hence, that the claims as previously presented, are patentable over the prior art references cited in the previous Office Action.

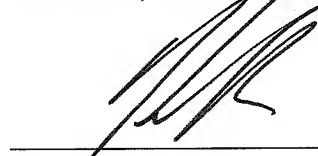
CONCLUSION

Based on the foregoing, Applicants respectfully request entry of the instant amendment and a Notice of Allowability for claims 1, 3, 5, 7-14, 16-20, 22 and 23.

If it is determined that the application is not in a condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned attorney to expedite prosecution of the present application. If there are any additional fees resulting from this communication, please charge the same to our Deposit Account No. 18-0160, our Order No. APX-12571.001.

Respectfully submitted,

RANKIN, HILL, PORTER & CLARK LLP



Kenneth A. Clark
Reg. No. 32,119
Christopher J. Korff
Reg. No. 55,342

925 Euclid Avenue
Suite 700
Cleveland, Ohio 44115-1405
(216) 566-9700